

WHAT IS CLAIMED IS:

1. A film-forming method comprising:  
introducing oxygen radicals and an organic raw material gas containing a metal element into a vacuum container; and  
reacting the organic raw material gas with the oxygen radicals, thereby forming a metal oxide film on a surface of a substrate disposed in the vacuum container.
2. A film-forming method comprising:  
introducing oxygen radicals and an organic raw material gas containing a metal element into a vacuum container such that the organic raw material gas and the oxygen radicals are for the first time brought into contact with each other in the vacuum container; and  
reacting the organic raw material gas with the oxygen radicals, thereby forming a metal oxide film on a surface of a substrate disposed in the vacuum container.
3. The film-forming method according to claim 1, wherein  
the oxygen radicals and the organic raw material gas containing a metal element are introduced into a film-forming treatment space by way of a plurality of injection holes, and the organic raw material gas is reacted with the oxygen radicals in the film-forming treatment space, thereby a metal oxide film is formed on the surface of the substrate;  
said film-forming treatment space is defined in the vacuum container by a space between a substrate disposed in the vacuum container and a plurality of injection holes disposed to face said substrate.
4. The film-forming method according to claim 2, wherein  
the oxygen radicals and the organic raw material gas containing a metal element are introduced into a film-forming treatment space by way of a plurality of injection holes, and the organic raw material gas is reacted with the oxygen radicals

in the film-forming treatment space, thereby a metal oxide film is formed on the surface of the substrate;

said film-forming treatment space is defined in the vacuum container by a space between a substrate disposed in the vacuum container and a plurality of injection holes disposed to face said substrate.

5. A film-forming method according to claim 1, wherein the metal element contained in the organic raw material gas is selected from the group consisting of ruthenium, hafnium, titanium, tantalum, zirconium and aluminum.

6. A film-forming method according to claim 2, wherein the metal element contained in the organic raw material gas is selected from the group consisting of ruthenium, hafnium, titanium, tantalum, zirconium and aluminum.

7. A film-forming method according to claim 3, wherein the metal element contained in the organic raw material gas is selected from the group consisting of ruthenium, hafnium, titanium, tantalum, zirconium and aluminum.

8. A film-forming method according to claim 4, wherein the metal element contained in the organic raw material gas is selected from the group consisting of ruthenium, hafnium, titanium, tantalum, zirconium and aluminum.

9. A film forming method comprising:  
generating oxygen radicals in a plasma generating space in a vacuum chamber;  
introducing an organic raw material gas containing a metal element and the oxygen radicals into a film forming treatment space in the vacuum chamber such that the organic raw material gas containing a metal element and the oxygen radicals are brought into contact with each other for the first time in the film forming treatment chamber; and  
reacting the organic raw material gas containing a metal element with the oxygen radicals to form a metal oxide film on a surface of a substrate disposed in the

vacuum chamber.

10. A film-forming method according to claim 9, wherein the metal element contained in the organic raw material gas is selected from the group consisting of ruthenium, hafnium, titanium, tantalum, zirconium and aluminum.